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Aksyuk 28-59-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s): Aksyuk et al.
Case: 28-59-1
Serial No.: 10/081,498
Filing Date: February 22, 2002
Group: 2874
Examiner: Michelle R. Connelly Cushwa

I hereby certify that this paper is being deposited on this date with the U.S. Postal Service as first class mail addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450
Signature: _____ Date: July 16, 2004

Title: Planar Lightwave Wavelength Device Using Moveable Mirrors

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DECLARATION OF PRIOR INVENTION UNDER 37 C.F.R. §1.131

We, the undersigned, hereby declare and state as follows:

1. We are the named inventors on the above-referenced U.S. patent application.

2. We conceived the invention that is the subject matter of one or more claims of the above-referenced application at least as early as June 13, 2001. Prior to June 13, 2001, we prepared an internal Lucent document entitled "MEMS – Waveguide Device Patetns." A copy of the presentation is attached hereto as Exhibit 1.

3. The invention was reduced to practice by manufacturing an optical device, comprising at least one waveguide for carrying an optical signal; and at least one mirror having an adjustable position to vary a path length of the optical signal. The optical device was manufactured and evaluated prior to or in conjunction with the preparation of the internal Lucent document. The optical device embodying the invention was used to obtain the initial experimental results referred to at pages 2-4 of the presentation.

4. All statements made herein of our own knowledge are true, and all statements made on information and belief are believed to be true.

5. We understand that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and may jeopardize the validity of the application or any patent issuing thereon.

Date: 7/15/04

Vladimir A. Aksyuk

Date: 7/15/04

Christopher R. Doerr

Date: 7/15/04

Dan Fuchs

MEMS – Waveguide devices patents

Inventors: Dan Fuchs, Chris Doerr, and Vladimir Aksyuk.

What:

- MEMS actuators in WG.
  - Moving mirrors for phase shifts (mirror)
  - Interferometers (dispersion compenstion) (glass)
- Applications:
  - switches couplers MMI.
  - Wavelength selective switches

Why:

- Business
- Publication

Existing Art:

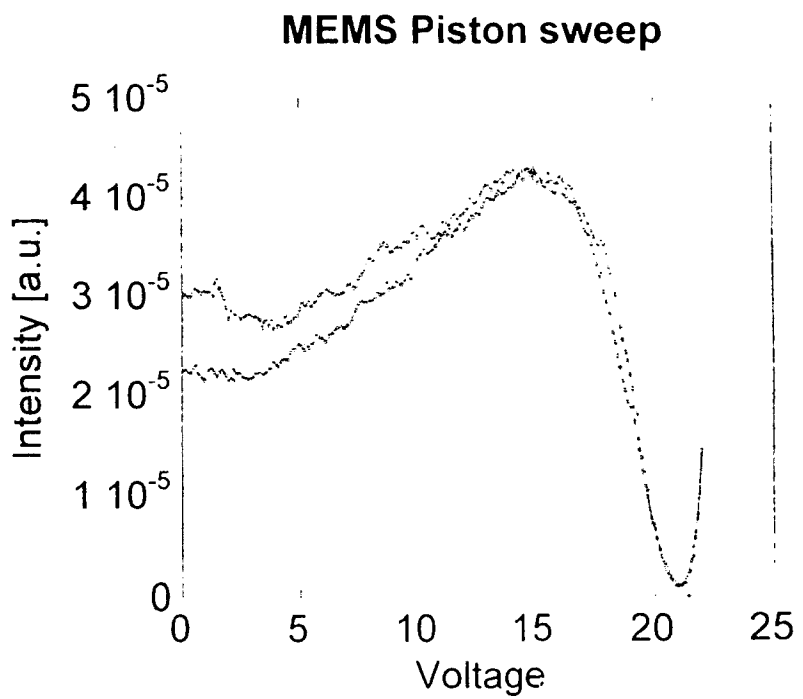
- Mechanically moving waveguides (OFC)
- Shutters in waveguides
- Lambda router connected to stack of AWG
- Switching between stacks of AWG

Patents:

- General patent
- Specific mirrors, wavelegth selective switch
- Glass membranes

MEMS piston sweep

- Can get max and min reflection.
- Drift of system, see around zero
- This is the round trip, ramp-up and ramp down voltage
- 6 wiggle mirror
- Snap down between 22.1 and 22.2
- Snap up between 17.1 and 17.2
- Need to use the range above snap up.
- Need longer range.



piezo sweep

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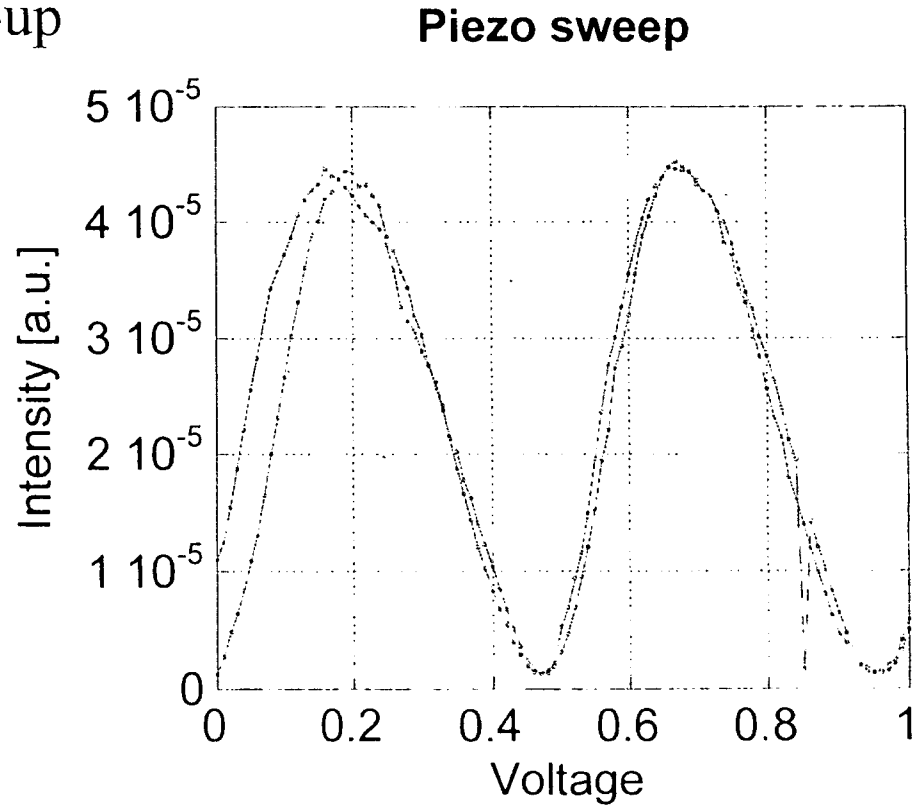
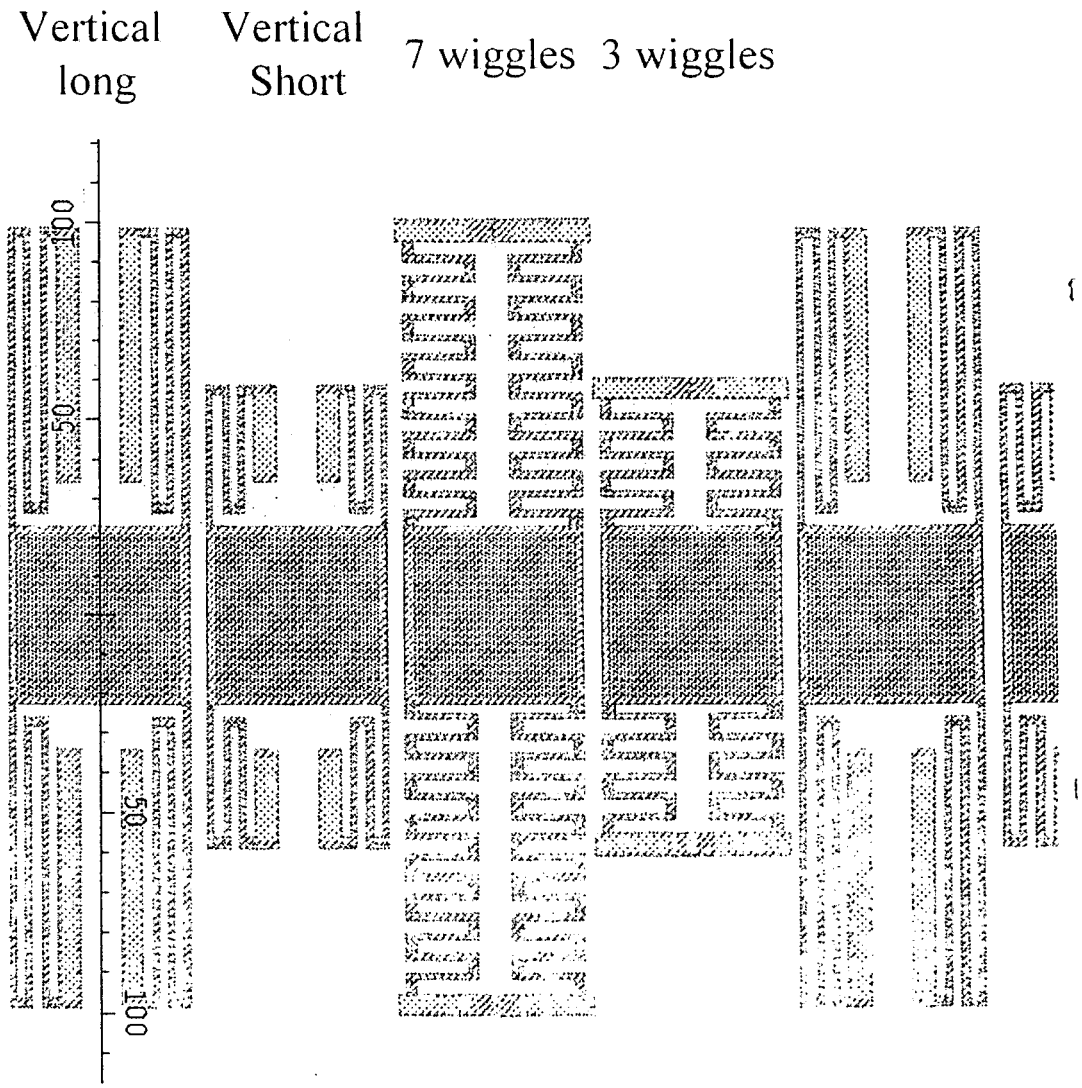


Measured deflections

	Snapdown	Max actuation	remarks
7 wiggle	21.9V	0.63μm	
3 wiggle	67.6V	0.77μm	
Vertical long	23.3V	0.7μm	
Vertical short	69.9V	0.7μm	Big (about 0.1μm) horizontal tilt due to misalignment

- Max actuation is not accurate but no design gives as much as $\lambda/2$ (0.8 μm), even though $\lambda/4$ is also good.
- Need to test crosstalk.
- Need to mount with waveguide.

The four type of springs:



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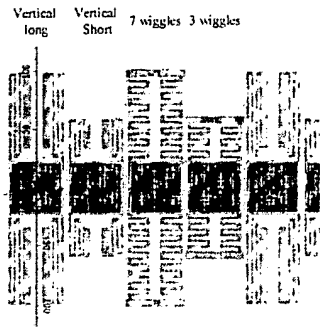

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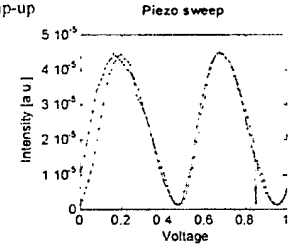

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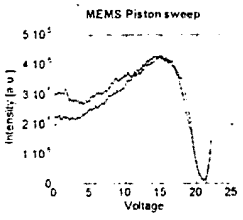
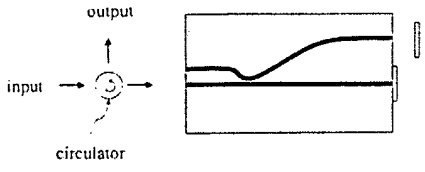


schematic



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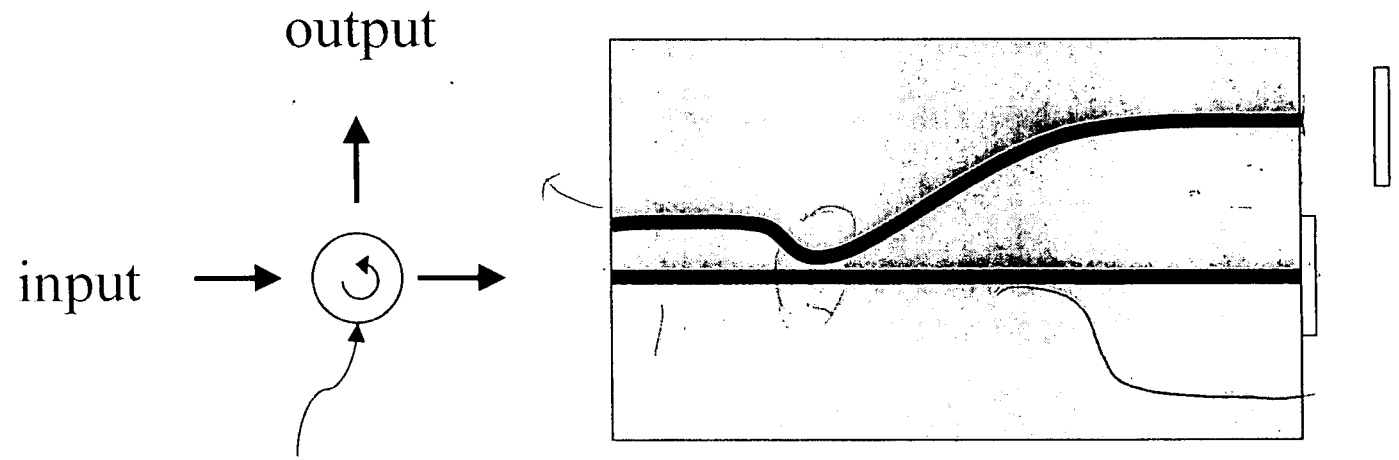

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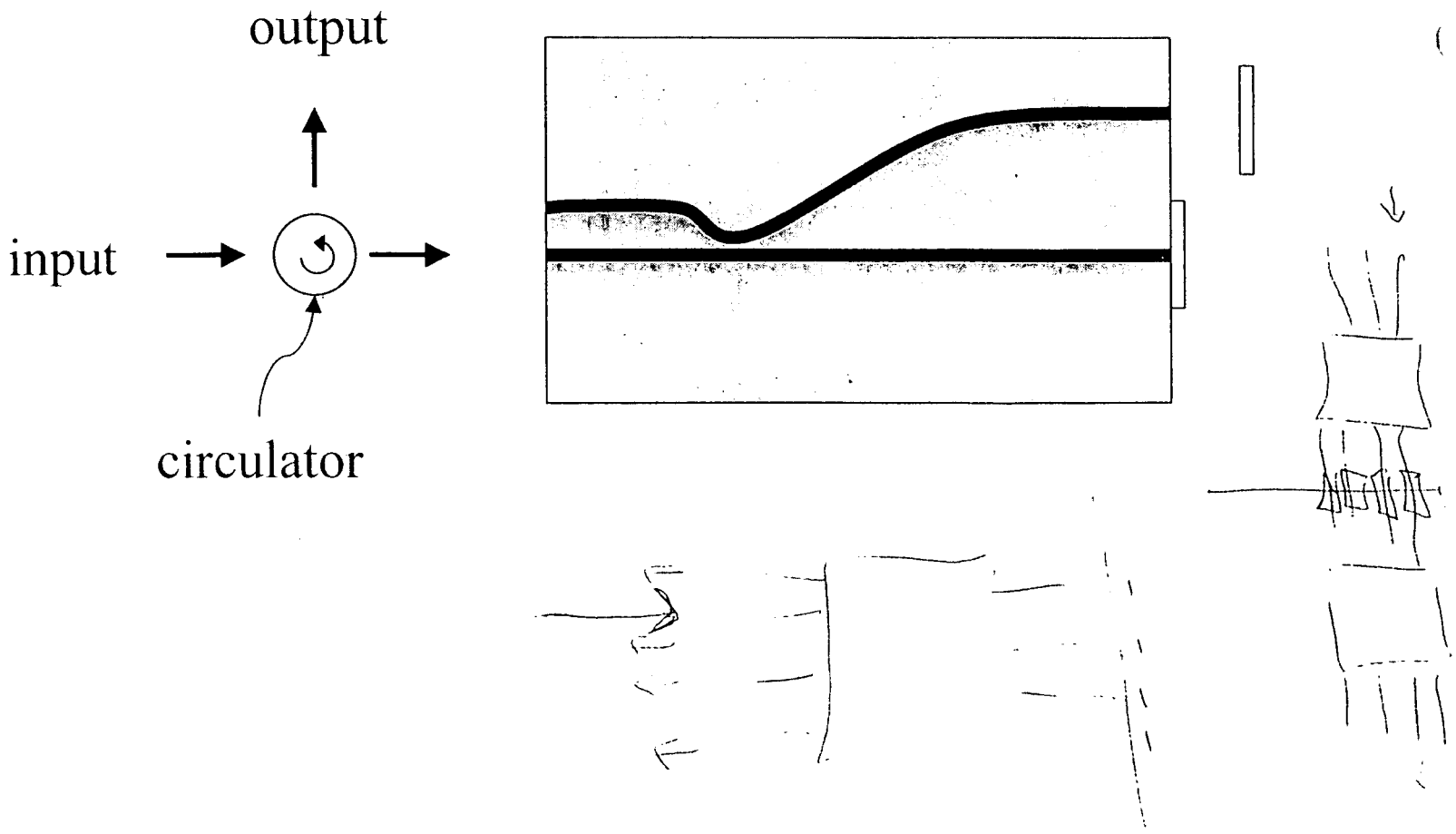

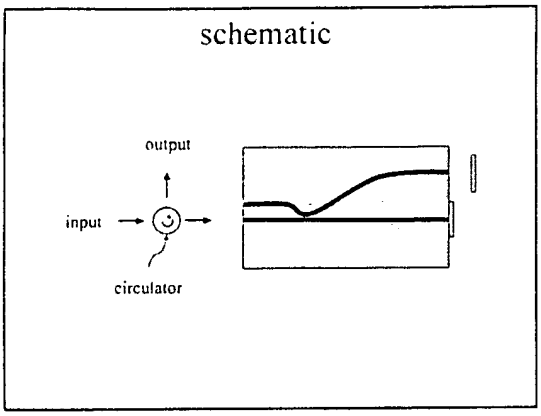
schematic
output
input
circulator